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LOW VISCOSITY METHYL METHACRYLATE COATING COMPOSITION CONTAINING HIGH VISCOSITY METHYL METHACRYLATE POLYMER

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This invention relates to liquid coating compositions. More particularly it relates to coating compositions or lacquers of improved spraying and coating characteristics based on certain relatively low viscosity polymers of methyl methacrylate as essential film forming constituents and modified with a small amount of relatively high viscosity polymers of methyl methacrylate.

Dry films or coatings obtained from the application of liquid coating compositions employing a polymer of methyl methacrylate as the principal film forming constituent are known to have outstanding durability and gloss retention. Coating compositions of this kind, sometimes referred to hereinafter as methyl methacrylate lacquers, have been especially adapted for spray application and have been put to large scale use in the coating of automobile bodies to give unusually durable and high gloss topcoats. These sprayable methyl methacrylate lacquers are particularly characterized by containing as an essential film former a polymer of methyl methacrylate having a relative viscosity of about 1.117 to 1.196, determined as described hereinafter.

In preparing practical, sprayable methyl methacrylate lacquers it has been found necessary heretofore to use extreme care to provide a solvent mixture for the lacquer which has a proper balance of properties. Factors such as volatility and solvency for the polymer of methyl methacrylate are characteristics of the solvent mixtures that have been important.

Generally speaking, there is a preference for the use of relatively low boiling organic liquids as solvents in making coating compositions because they are ordinarily less expensive than high boiling solvents and, as in the case of methyl methacrylate polymers, they are ordinarily better solvents for the film former. Unfortunately, the use of low boiling solvent, or too much of such solvent, has not been practical in making sprayable methyl methacrylate lacquers because the resulting lacquers give what is known in the art as too dry a coating and a resulting uneven and unsatisfactory finish. It has been necessary therefore to include in the solvent mixture for sprayable methyl methacrylate lacquers relatively large amounts of high boiling solvents. This introduces undesirable characteristics. Such high boiling solvents generally cost more, they do not dissolve as much methyl methacrylate polymer and therefore less solids can be applied in a given coat and the resulting coatings are slower drying.

Even those sprayable methyl methacrylate lacquers used heretofore which have the best balance of properties leave something to be desired in application properties. For example overspray on a surface being coated tends to form a rough surface; it does not, as the applicators say, "melt in." Thus, if one-half of the top of an automobile hood is spray coated on an assembly line, for example, and the other half is spray coated just a little later, the overspray from the first half causes an unevenness on the adjacent area when the second half is coated; and the overspray from the second half coating causes a roughness on the surface of the adjacent first-half coating. Fortunately, this is not usually serious if the coating is to be baked shortly afterwards, for the overspray

ordinarily melts-in in the baking step. The problem is a serious one however, and the roughness often remains, in touch-up or refinishing operations where the application and baking techniques may not be so carefully standardized or controlled, or where lower drying temperatures are used, or air drying is relied upon rather than baking.

We have found that the aforesaid difficulties with respect to obtaining satisfactorily wet spray coatings and melt in of overspray are overcome or greatly minimized, while at the same time making possible the use of lower boiling and hence ordinarily more economical and better solvents for the polymer, by including in the methyl methacrylate lacquer a very small amount, specifically from about 0.02 to 0.5 percent based on the weight of the lacquer of a polymer of methyl methacrylate having a relative viscosity of at least 3.0.

The polymers of methyl methacrylate suitable for use as the essential film forming constituent in the compositions of this invention are those having a relative viscosity of about 1.117 to 1.196 as indicated above, and more preferably of about 1.148 to 1.183; and the polymers of methyl methacrylate suitable for use as the modifying component in the compositions of the invention are those having a relative viscosity of at least 3.0, more preferably 5.0, and most preferably 6.0 to 9.0.

The term "relative viscosity" as used herein in reference to polymers of methyl methacrylate employed in the compositions of the invention is the value obtained by dividing the efflux time of a solution, A, of the polymer of methyl methacrylate by the efflux time of the solvent, B, used in said solution, the efflux times being measured in accordance with the procedure of ASTM–D–445–46T, Method B, using as polymer solution A, a solution of 0.25 gram of the polymer of methyl methacrylate being tested in 50 cc. of ethylene dichloride, and as the solvent B, ethylene dichloride. The efflux times are determined at 25° C. in a standard apparatus currently marketed under the designation of a Modified Ostwald Viscosimeter, Series 50.

The polymers of methyl methacrylate useful in making the compositions of the invention are either homopolymers of methyl methacrylate or copolymers with minor amounts, for example, in the order of 2 to 25 percent by weight of another material copolymerizable therewith, for instance acrylic acid, methacrylic acid, the 1 to 4 carbon alkyl (i.e. methyl to butyl) esters of acrylic acid, the 2 to 4 carbon alkyl (i.e. ethyl propyl and butyl) esters of methacrylic acid, vinyl acetate, acrylonitrile and styrene. A preferred copolymer contains about 98 percent of methyl methacrylate and two percent methacrylic acid. Thus, the term "polymer of methyl methacrylate" and related terms as used herein refer to such homopolymers and copolymers as well as mixtures of homopolymers, mixtures of copolymers and mixtures containing both homopolymer and copolymer.

Polymers of methyl methacrylate for use as the essential film forming component in the compositions of the invention can be prepared according to well-known methods by polymerizing methyl methacrylate monomer, with or without another monomer copolymerizable therewith, either in bulk, in solution, or in granular form to produce products having the required relative viscosity. A preferred method is solution polymerization in which, for example suitable proportions of methyl methacrylate monomer, catalyst and solvent are heated for about 2 to 9 hours under reflux conditions while agitating. Methyl methacrylate polymers having relative viscosity within the range required for the essential film forming component of the compositions of the invention can be made according to this method using the amounts and conditions indicated in Table I, in which all ingredients are by weight.